of them had been obliterated at the time of the writer's visit.

On the other hand, the effect on the underground water conditions proves that there was movement in the rocks of this area attending the earthquake, and strongly suggests that there was movement along this old fault plane. As shown in the Birmingham geologic folio, published by the United States Geological Survey, this fault passes approximately through the center of Irondale. Practically all the wells along the eastern end of the fault, as shown on that map, either went dry or the water level in them was materially lowered. Most of the wells which went dry are located one block south of the fault line on a slight elevation, as compared with the others in town. Within a block five wells, ranging from 35 to 40 feet deep, went dry, whereas the sixth in the row which was only 14 feet deep did not. Two other wells, probably along the eastern extension of this fault or near it went dry. One is a few hundred yards east of the center SE. ¼ sec. 29, T. 17 S., R. 1 W., 4 miles east of Irondale; it was 28 feet deep and had 7 feet of water in it before the earthquake. The second well is 200 yards east of center of W. line of SW. ¼ sec. 19, T. 17 S., R. 1 W.; it was 47⅓ feet deep and had produced water for two years before the earthquake. After the well went dry it was found to have a crack 1½ inches wide crossing its bottom in the direction N. 33° E. This crack, which did not show at the surface or in the upper part of the well, has been followed downward in deepening the well about 30 feet. The well is still dry in spite of its increased depth and the crack still shows in the bottom of the well.

Conclusions.—The direction of movement, the intensity of the shock, and the effect upon the underground water near Irondale, suggest that the locus of the disturbance which produced the earthquake was along the Red Gap fault, which runs through Irondale; and that the movement along this fault was horizontal rather than vertical. Had the movement along this fault been vertical the direction of the resultant vibrations would have been at right angles to the line of fault, or approximately north and south, instead of east and west as it was found to be. The occurrence of the fissure in the well described above may be the result of this horizontal or torsional movement.

SEISMOLOGICAL REPORTS FOR DECEMBER, 1916.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Dec. 1, 1916.]

TABLE 1.—*Noninstrumental earthquake reports, December, 1916.*

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
		ARIZONA.								
1916.	*H. m.*		° ′	° ′			*M. s.*			
Dec. 12	12 45	Fort Apache	33 47	109 55	5	1	0 3	Rumbling		J. C. F. Tillson, jr.
	12 45	Henry's Camp	33 41	109 48	5	1	7		Awakened people	G. J. Henry.
	12 45	Holbrook	34 54	110 08	5	1	15	None		Thorwald Larson.
	12 45	Lakeside	34 06	109 59	4–5	1	60	None	Dishes rattled	T. H. Owens.
	12 45	Pinedale	34 19	110 15	5	2	6	None		E. Thomas, jr.
	12 45	Plato	35 05	109 38	5	1	15	Rumbling	Doors slammed	Mrs. Celia Henning.
	12 45	Shumway	34 26	110 04	5	1	3	Rumbling		F. R. Wigely.
	12 45	Snowflake	34 33	110 04	4	1		None	Awakened people	W. J. Flake.
	12 45	St. Michaels	35 38	109 05	5	1		Rumbling	Some plaster cracked	St. Michaels School.
	12 45	Thatcher	32 50	109 47	3	1	20	None		T. C. Snow.
		CALIFORNIA.								
1	22 50	San Luis Obispo	35 18	120 39	7	1	0 8	Rumbling	Plaster fell	U. S. Weather Bureau.
	22 50	Santa Maria	34 58	120 28	3	1		None		Walter White.
7	18 55	Calexico	32 40	115 28	5	1		Rumbling		F. R. Spencer.
7	20 30	Bishop	37 21	118 22	3	2	8	None		E. L. Herzinger.
7	20 45	Calexico	32 40	115 28	5	1		Rumbling		F. R. Spencer.
18	19 30	Calexico	32 40	115 28	2	1		Rumbling		F. R. Spencer.
		KENTUCKY.								
19	5 42	Hickman	36 35	89 12	5–6	2		Rumbling	Bricks shaken from chimneys	J. C. Sexton.

TABLE 2.—*Instrumental seismological reports, December, 1916.*

[Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.]

[For significance of symbols see this REVIEW, January, 1916, p. 39.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.

Alaska. *Sitka.* *Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat., 57° 03′ 00″ N.; long., 135° 20′ 06″ W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: V / T_0: E 10 16.6; N 10 15.4

(No earthquake recorded during December, 1916.)

Arizona. *Tucson.* *Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat., 32° 14′ 48″ N.; long., 110° 50′ 06″ W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: V / T_0: E 10 13.9; N 10 19.1

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 12	.....	e.....	12-44-45	.....	.....	.....	.....	Earthquake in eastern Arizona.
		M_E....	12-45-10	4	.....	.....	.....	
		F.....	12-49-00	.....	.....	.....	.....	

California. *Berkeley.* *University of California.*

Lat., 37° 52′ 16″ N., long., 122° 15′ 37″ W. Elevation, 85.4 meters.

(*See* Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton.* *Lick Observatory.*

Lat., 37° 20′ 24″ N.; long., 121° 38′ 34″ W. Elevation, 1,281.7 meters.

(*See* Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma.* *Raja Yoga Academy.* F. J. Dick.

Lat., 32° 43′ 03″ N.; long., 117° 15′ 10″ W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 2	.....	.....	.....	.....	*200	*200	.....	Tremors during 24 hours preceding 15h on dates given.
3	.....	.....	.....	.....	*450	*450	.....	
4	.....	.....	.....	.....	*300	*400	.....	
5	.....	.....	.....	.....	*100	*100	.....	
9	.....	.....	.....	.....	*100	*200	.....	
11	.....	.....	.....	.....	*200	*200	.....	
14	.....	.....	.....	.....	*200	*200	.....	
16	.....	.....	.....	.....	*200	*300	.....	
22	.....	.....	.....	.....	*100	*100	.....	
24	.....	.....	.....	.....	*50	*100	.....	
28	.....	.....	.....	.....	*200	*400	.....	

*Amplitudes on instrument.

California. *Santa Clara.* *University of Santa Clara.* J. S. Ricard, S. J.

Lat., 37° 20′ 36″ N.; long., 121° 57′ 03″ W. Elevation, 27.43 meters.

(See record of the Seismographic Station, University of Santa Clara.)

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.

Colorado. *Denver.* *Sacred Heart College.* Earthquake Station. A. W. Forstall, S. J.

Lat., 39° 40′ 36″ N.; long., 104° 56′ 51″ W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

Instrumental constants .....

(No earthquakes observed during December, 1916.)

District of Columbia. *Washington.* *U. S. Weather Bureau.*

Lat., 38°, 54′ 12″ N.; long., 77° 03′ 03″ W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants.. V 110 T_0 6.4

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 14	.....	P.....	17 03 40	.....	.....	.....	7,645	
		S.....	17 12 42	.....	.....	.....	.....	
		eL?..	17 26 00	.....	.....	.....	.....	
		L.....	17 33 30	16	.....	.....	.....	
		F.....	18 00 00	.....	.....	.....	.....	
23	.....	P.....	9 34 42	.....	.....	.....	6,900	
		S.....	9 43 06	.....	.....	.....	.....	
		L.....	9 51 40	.....	.....	.....	.....	
		L.....	10 05 01	20	.....	.....	.....	
		F.....	10 20 ..	.....	.....	.....	.....	F in microseisms.

District of Columbia. *Washington.* *Georgetown University.* F. L. Tondorf, S. J.

Lat., 38° 54′ 25″ N.; long., 77° 04′ 24″ W. Elevation, 42.4 meters. Subsoil: decayed diorite.

Instruments: Wiechert 200 kg., astatic, horizontal pendulums; 80 kg., vertical.

Astatic pendulums after Mainka, 130 kg.

Instrumental constants: V / T_0 / ϵ: E 165 5.4 0; N 143 5.2 0; *Z 80 3.0 0*

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 14	.....	eP.....	17 03 41	.....	.....	.....	.....	Heavy microseisms due to wind. No distinct maximum
		eSE...	17 12 15	.....	.....	.....	.....	
		eSE...	17 12 47	.....	.....	.....	.....	
		eLE...	17 23 39	.....	.....	.....	.....	
		eLN...	17 23 44	.....	.....	.....	.....	
		LE....	17 33 30	36	.....	.....	.....	
		LN....	17 33 44	36	.....	.....	.....	
		F.....	18 03 00	.....	.....	.....	.....	
23	.....	ePE...	9 34 40	.....	.....	.....	.....	Heavy wind markings. No distinct maximum. F lost in wind markings.
		ePE...	9 34 52	.....	.....	.....	.....	
		iSE...	9 43 05	.....	.....	.....	.....	
		SN....	9 43 08	.....	.....	.....	.....	
		eLE...	9 53 25	.....	.....	.....	.....	
		eLE...	9 53 27	.....	.....	.....	.....	

TABLE 2.—*Instrumental seismological reports, December, 1916*—Continued.

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Frank Neumann.

Lat., 21° 19′ 12″ N.; long., 158° 03′ 48″ W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

T_0
Instrument constant.. 18.5

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Dec. 2		L	12 22 54	19				
		M	12 40 54		*200			
		F	13 21 00					
2		L	23 10 00	20				
		M	23 15 00		*100			
		F	23 28 00					
5		L	15 52 12	18				Merely a broadening of the line.
		M	15 54 12					
		F	15 58 18					
13		L	22 03 48	18				Probably air tremors.
		M	22 06 00		*100			
		F	22 08 12					
14		e	17 08 00	20				
		M	17 17 00		*1000			
		C	17 19 54					
20		P	19 15 12					
		L	19 19 30	17				
		M	19 22 00		*100			
		C	19 26 05					
		F	19 28 18					
21		L	14 42 12	20				
		M	14 46 30		*400			
		C	14 49 00					
		F	14 50 18					
22		L	16 35 06	21				
		M	16 39 36		*100			
		C	16 48 12					
23		P	9 48 24					
		S	9 56 06					
		L	10 05 24	20				
		M	10 14 24		*2200			
		C	10 21 00					
		F	10 26 00					
26		P	20 30 42					
		L	20 42 54	23				
		M	20 48 00		*1500			
		C	20 50 48					
		F	21 34 54					
27		P	21 58 42					
		L	22 07 12	22				
		M	22 15 18		*700			
		C	22 23 30					
		F	22 46 00					

*Trace amplitude.

Kansas. *Lawrence. University of Kansas.* Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57′ 30″ N.; long., 95° 14′ 58″ W. Elevation, 301.1 meters.

Instrument: Wiechert.

		V	T_0	ε
Instrumental constants..	E	177	3.4	4
	N	205	3.4	4

(Report for December, 1916, not received.)

Maryland. *Cheltenham. Magnetic Observatory.* U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44′ 00″ N.; long., 76° 50′ 30″ W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

		V	T_0
Instrumental constants..	E	10	32
	N	10	27

(No earthquake recorded during December, 1916.)

Massachusetts. *Cambridge. Harvard University Seismographic Station.* J. B. Woodworth.

Lat., 42° 22′ 36″ N.; long., 71° 06′ 59″ W. Elevation, 5.4 meters. Foundation, glacial sand over clay.

Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

		V	T_0	ε:1
Instrumental constants..	E	80	23	0
	N	50	25	4:1

(The records from Harvard University are several months behind and will appear in "Table 3.—Late reports," as rapidly as they are measured.)

Missouri. *Saint Louis. St. Louis University.* Geophysical Observatory. J. B. Goesse, S. J.

Lat., 38° 38′ 15″ N.; long., 90° 13′ 58″ W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.

Instruments: Wiechert 80 kg. astatic, horizontal pendulum.

	V	T_0	ε:1
Instrumental constants..	80	7	5:1

(Report for December, 1916, not received.)

New York. *Buffalo. Canisius College.* John A. Curtin, S. J.

Lat., 42° 53′ 02″ N.; long., 78° 52′ 40″ W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

	V	T_0	ε:1
Instrumental constants..	80	7	5:1

(Report for December, 1916, not received.)

New York. *Fordham. Fordham University.* W. C. Repetti, S. J.

Lat., 40° 51′ 47″ N.; long., 73° 53′ 08″ W. Elevation, 23.9 meters.

Instrument: Weichert, 80 kg.

		V	T_0	ε
Instrumental constants..	E	72	7.1	1.5:1
	N	72	6.8	3.8:1

(Report for December, 1916, not received.)

New York. *Ithaca. Cornell University.* Heinrich Ries.

Lat., 42° 26′ 58″ N.; long., 76° 29′ 09″ W. Elevation, 242.6 meters.

Instruments: Two Bosch-Omori, 25 kgm., horizontal pendulums (mechanical registration).

		V	T_0	ε
Instrumental constants..	E	13	22	4:1
	N	14	25	4:1

1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Dec. 24		eL_E	17 27 40	19				Microseisms present.
		eL_N	17 30 32	25				
		F_E	17 43 ..					
		F_N	17 45 ..					

Panama Canal Zone. *Balboa Heights.* Isthmian Canal Commission.

Lat., 8° 57′ 39″ N.; long., 79° 32′ 29″ W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori, 100 kg.

	V	T_0
Instrumental constants..	10	20.

1916.			*H. m. s.*	*Sec.*	μ	μ	*Km.*	
Dec. 10		P_E	3 45 46				170	Direction? Phases indistinct on N–S, maximum amplitude 10μ.
		L_E	3 46 04					
		M_E	3 46 10		70			
		F_E	3 46 38					
19		P	3 53 40				113	Direction?
		L	3 53 50					
		M	3 53 50		100	120		
		F_E	3 54 45					
		F_N	3 55 00					

TABLE 2.—*Instrumental seismological reports, December, 1916*—Concld.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_N	Amplitude. A_W	Distance.	Remarks.

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. L. Adams.

Lat., 18° 09′ N.; long., 65° 27′ W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants.. V / T_0: E 10 18.0; N 10 19.5

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 23	.....	eP_N	9 32 06	3	.....	.....	.....	
		eP_E	9 32 30	3	.....	.....	.....	
		S	9 38 09	4	.....	.....	.....	
		eL_{EW}	9 43 00	14	.....	.....	.....	No long waves apparent on E-W.
		M_W	9 55 00	14	.....	120	.....	
		C_W	10 00 00	.....	.....	.....	.....	
		F	10 25 00	.....	.....	.....	.....	

Vermont. *Northfield. U. S. Weather Bureau.* Wm. A. Shaw.

Lat., 44° 10′ N.; long., 72° 41′ W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants.. V / T_0: E 10 15; N 10 16

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 14	.....	L	17 35 00 17 40 00	.....	.....	.....	.....	Very feeble record. Phases indiscernible.

Canada. *Ottawa. Dominion Astronomical Observatory.* Earthquake Station. Otto Klotz.

Lat., 45° 23′ 38″ N.; long., 75° 42′ 57″ W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph.

Instrumental constants: V 120; T_0 26

1916.			H. m. s.	Sec.	μ	μ	Km.	
Dec. 14	.....	*O*	16 52 05	.....	.....	.....	7,770	Strong microseisms mask much on N-S.
		P_E	17 03 14	.....	.....	.....	.....	
		S_E	17 12 22	.....	.....	.....	.....	
		eL?	17 25 ..	.....	.....	.....	.....	
		L	17 28 ..	20–18	.....	.....	.....	
		L	17 33 ..	19–18	.....	.....	.....	
		L	17 36 ..	16–15	.....	.....	.....	
		F	17 50 ..	.....	.....	.....	.....	
23	.....	S_N?	9 44 14	.....	.....	.....	10,000?	Strong microseisms prevail.
		iS_E	9 44 24	.....	.....	.....	.....	
		eL_{EW}	10 04 24	20	.....	.....	.....	F masked by microseisms.
		L_W	10 10 ..	18	.....	.....	.....	

O—time at origin.

Canada. *Toronto. Dominion Meteorological Service.*

Lat., 43° 40′ 01″ N.; long., 79° 23′ 54″ W. Elevation, 113.7 meters. Subsoil: Sand and clay.

Instrument: Milne horizontal pendulum, North. In the meridian.

Instrumental constant.. T_0 18. Pillar deviation, 1 mm., swing of boom=0.50″.

(Report for December, 1916, not received.)

Canada. *Victoria, B. C. Dominion Meteorological Service.*

Lat., 48° 24′ N.; long., 123° 19′ W. Elevation, 67.7 meters. Subsoil: Rock.

Instrument: Wiechert, vertical: Milne horizontal pendulum, North. In the meridian.

Instrumental constant.. T_0 18. Pillar deviation, 1 mm., swing of boom=0.54″.

(Report for December, 1916, not received.)

TABLE 3.—*Late seismological reports. (Instrumental.)*

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_N	Amplitude. A_W	Distance.	Remarks.

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Frank Neumann.

Lat., 21° 19′ 12″ N.; long., 158° 03′ 48″ W. Elevation, 15.2 meters.

Instruments: Mine seismograph of the Seismological Committee of the British Association.

Instrumental constant.. T_0 18.5

1916.			H. m. s.	Sec	μ	μ	Km.	
Nov. 3	.....	L	22 17 30	21	.....	.....	.....	
		M	22 21 12	.....	*300	.....	.....	
		F	22 29 36	.....	.....	.....	.....	
10	.....	L	9 29 12	.....	.....	.....	.....	
		M	9 30 00	.....	.....	.....	.....	
		C	9 37 00	.....	.....	.....	.....	
11	.....	P	13 34 00	.....	.....	.....	.....	Some doubt as to motion previous to 13h 40m.
		S	13 39 42	.....	.....	.....	.....	
		L	13 43 48	19	.....	.....	.....	
		M	13 47 48	.....	*400	.....	.....	
		C	13 51 30	.....	.....	.....	.....	
		F	14 31 00	.....	.....	.....	.....	
11	.....	P	15 20 54	.....	.....	.....	.....	
		S	15 26 00	.....	.....	.....	.....	
		L	15 31 00	19	.....	.....	.....	
		M	15 35 00	.....	*400	.....	.....	
		C	15 47 00	.....	.....	.....	.....	
		F	16 32 00	.....	.....	.....	.....	
13	.....	L	7 06 42	.....	.....	.....	.....	
		M	7 08 30	.....	.....	.....	.....	
		C	7 17 00	.....	.....	.....	.....	
13	.....	e	11 55 00	.....	.....	.....	.....	Phases uncertain.
		L	12 08 12	19	.....	.....	.....	
		M	12 11 00	.....	*200	.....	.....	
		F	12 50 00	.....	.....	.....	.....	
14	.....	P	23 01 00	.....	.....	.....	.....	
		L	23 08 12	19	.....	.....	.....	
		M	23 14 48	.....	*400	.....	.....	
		C	23 21 42	.....	.....	.....	.....	
		F	23 33 ..	.....	.....	.....	.....	
18	.....	P	11 50 00	.....	.....	.....	.....	Phases not distinct.
		S	11 53 48	.....	.....	.....	.....	
		L	12 00 00	19	.....	.....	.....	
		M	12 17 12	.....	*300	.....	.....	
		C	12 22 00	.....	.....	.....	.....	
		F	12 28 30	.....	.....	.....	.....	
20	.....	P	23 48 42	.....	.....	.....	.....	
		L	22 57 00	19	.....	.....	.....	
		M	23 01 00	.....	*300	.....	.....	
		C	23 04 00	.....	.....	.....	.....	
		F	23 11 00	.....	.....	.....	.....	
21	.....	L	3 06 54	.....	.....	.....	.....	Merely a broadening of the line.
		C	3 15 00	.....	.....	.....	.....	
21	.....	eP	6 36 12	.....	.....	.....	.....	
		S	6 44 00	.....	.....	.....	.....	
		eL	6 53 54	20	.....	.....	.....	
		M	6 57 12	.....	*1200	.....	.....	
		C	7 05 00	.....	.....	.....	.....	
		F	8 35 00	.....	.....	.....	.....	
24	.....	P	2 59 36	.....	.....	.....	.....	
		L	3 08 54	18	.....	.....	.....	
		M	3 11 42	.....	*200	.....	.....	
		C	3 15 00	.....	.....	.....	.....	
		F	3 18 00	.....	.....	.....	.....	
24	.....	P	4 19 54	.....	.....	.....	.....	
		L	4 33 00	19	.....	.....	.....	
		M	4 45 48	.....	*200	.....	.....	
		F	4 51 00	.....	.....	.....	.....	
24	.....	L	13 22 00	19	.....	.....	.....	Phases doubtful on account of irregular motion of paper.
		M	13 28 36	.....	*100	.....	.....	
		C	13 32 12	.....	.....	.....	.....	
24	.....	L	22 20 24	.....	.....	.....	.....	Merely a broadening of the line.
		C	22 41 00	.....	.....	.....	.....	
27	.....	e	6 53 00	19	.....	.....	.....	
		M	6 54 12	.....	*300	.....	.....	
		C	6 57 30	.....	.....	.....	.....	
		F	7 11 00	.....	.....	.....	.....	
30	.....	e	3 58 30	.....	.....	.....	.....	
		L	4 04 18	19	.....	.....	.....	
		M	4 10 12	.....	*300	.....	.....	
		C	4 14 00	.....	.....	.....	.....	
		F	4 45 00	.....	.....	.....	.....	

* Trace amplitude.

TABLE 3.—*Late seismological reports.* (*Instrumental*)—Concluded.

Date.	Character.	Phase.	Time.	Period T.	Amplitude. A_H	Amplitude. A_N	Distance.	Remarks.
Massachusetts. *Cambridge. Harvard University Seismographic Station.*								
[J. B. Woodworth temporarily absent. Records interpreted and measured by the U. S. Weather Bureau.]								
Lat., 42° 22′ 36″ N.; long., 71° 06′ 59″ W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.								
Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).								
Instrumental constants.—			V	T_0	ε:1			
			E	80	23	0		
			N	50	25	4:1		
1916. June 2	.....	P_H	14 05 40	.....	.....	.....	3,190	
		PR_H	14 06 36	.....	.....	.....	.....	
		S	14 10 37	.....	.....	.....	.....	
		L	14 14 47	.....	.....	.....	.....	
		L	14 20 22	18	.....	.....	.....	
		F	14 50 ..	.....	.....	.....	.....	F in microseisms.
3	.....	eL_H	6 11 30	.....	.....	.....	.....	Very feeble record.
		F	6 22 00	.....	.....	.....	.....	
15	.....	e_H	11 39 53	.....	.....	.....	.....	Sheet changed at 13h 18m before end of quake.
		L_H	12 45 00	20	.....	.....	.....	
19	.....	P_H?	1 24 53	.....	.....	.....	2,990?	
		PR_H?	1 26 48	.....	.....	.....	.....	
		S_H	1 29 33	.....	.....	.....	.....	
		L_H?	1 34 45	.....	.....	.....	.....	
		L_H	1 42 00	20	.....	.....	.....	
		F	2 10 00	.....	.....	.....	.....	
20	.....	eL_H	7 27 15	.....	.....	.....	.....	
		F	7 50 00	.....	.....	.....	.....	
21	.....	iP	21 43 19	.....	.....	.....	6,925	
		PR	21 45 20	.....	.....	.....	.....	
		S	21 51 44	.....	.....	.....	.....	
		SR	21 55 15	.....	.....	.....	.....	
		L	22 01 40	.....	.....	.....	.....	F in microseisms.
24	.....	L_H	7 21 00	.....	.....	.....	.....	Record feeble, phases indistinct.
		F	8 00 00	.....	.....	.....	.....	
25	.....	e_H	18 28 00	.....	.....	.....	.....	
		S_H?	18 34 45	.....	.....	.....	.....	
		L_H	18 40 00	.....	.....	.....	.....	
		F	19 20 00	.....	.....	.....	.....	
30	.....	P	3 08 29	.....	.....	.....	5,080	
		S	3 15 15	.....	.....	.....	.....	
		SR	3 18 52	.....	.....	.....	.....	
		L	3 22 42	.....	.....	.....	.....	
		F	3 50 00	.....	.....	.....	.....	

SEISMOLOGICAL DISPATCHES.[1]

Kobe, Japan, December 1, 1916.

Damage caused by the earthquake of Sunday, November 25, which was briefly reported by cable, was considerably greater than was first indicated. It was the most severe in 25 years. Some of the Japanese earthquake experts believe the disturbance was due to the subsidence of subterranean fissures below the sea bottom, off the city of Kobe. (Assoc. Press.)

San Salvador, Republic of Salvador, December 20, 1916.

A volcanic explosion near the small village of Lower Verapaz, Guatemala, has caused the death of 15 persons. (Assoc. Press.)

Unionville, Nev., December 19, 1916.

Slight earth shocks were felt here on December 17th, 6:45 a. m. and on December 18th, 9 p. m., Pacific time. (Local observer.)

Redding, Cal., December 25, 1916.

Lassen Peak was in eruption to-day, emitting a great pillar of smoke. (Assoc. Press.)

Redding, Cal., December 28, 1916.

Two great pillars of smoke and steam poured from Lassen Peak to-day, rising almost vertically from the main crater and reaching an estimated height of 2,000 feet. The other smoke streamer from a smaller vent was about half as high. (Assoc. Press.)

[1] Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

EARTHQUAKES FELT IN THE UNITED STATES DURING 1916.

By W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Feb. 3, 1917.]

During 1916, 131 earthquakes strong enough to be felt were reported from different parts of the continental United States, as listed in the accompanying Table 1 and graphically represented (a dot for each report) on chart XI at the end of this issue of the REVIEW.

On February 21, a quake of intensity VI (Rossi-Forel), occurred near Asheville, N. C., that was reported from seven States. For further details see this REVIEW March, 1916, **44**; 154; also Taber in the Bulletin of the Seismological Society of America, v. **6**, p. 218.

On May 12 a quake of intensity VII, occurred near Boise, Idaho.

On October 18 a quake of intensity VII, occurred near Birmingham, Ala., that was reported from eight States. This is discussed in some detail by Finch and Hopkins in this issue of the REVIEW, p. 690–693.

None of these, however, did much damage; merely shook down some plaster, toppled over a few chimneys, and the like.

A few quakes of moderate intensities, V–VI, occurred in California, but none of them did any appreciable damage. A discussion by A. H. Palmer of the California earthquakes will appear in an early number of the Bulletin of the Seismological Society of America.

TABLE 1.—*Places in the United States reporting earthquakes during 1916.*

[Consult also Chart XI (XLIV–153).]

Place.	Approximate latitude (north).	Approximate longitude (west).	Number of quakes reported.	Place.	Approximate latitude (north).	Approximate longitude (west).	Number of quakes reported.
ALABAMA.	° ′	° ′		ARIZONA.	° ′	° ′	
Anniston	33 39	85 50	2	Clifton	33 04	109 17	1
Argo	33 42	86 31	2	Holbrook	34 54	110 08	1
Ashville	33 50	86 14	1	Nogales	31 20	110 52	1
Athens	34 50	86 59	1	Pinedale	34 19	110 15	1
Auburn	32 34	85 28	1	Pinto	35 05	109 38	1
Benton	32 19	86 47	1	Shumway	34 26	110 04	1
Bessemer	33 25	86 58	1	Snowflake	34 33	110 04	1
Birmingham	33 32	86 50	3	St. Michaels	35 38	109 05	1
Bridgeport	34 57	85 41	1	Thatcher	32 50	109 47	1
Calera	33 06	86 45	1				
Camden	32 00	87 16	1	CALIFORNIA.			
Camp Hill	32 46	85 37	1				
Clanton	32 49	86 39	1	Arrowhead Springs	34 15	117 16	1
Cordova	33 44	87 08	1	Avalon	33 27	118 22	1
Dadeville	32 48	85 44	1	Bakersfield	35 22	119 00	2
Decatur	34 36	87 00	1	Barrett	32 43	116 46	1
Easonville	33 32	86 16	1	Barstow	34 53	117 12	1
Eufaula	31 52	85 06	1	Beaumont	33 55	117 00	4
Florence	34 48	87 40	1	Bishop	37 21	118 22	1
Fort Deposit	31 59	86 36	1	Brawley	32 59	115 40	2
Gadsden	33 59	86 00	2	Bridgeport	38 18	119 15	1
Geneva	31 02	85 50	1	Cahuilla	33 32	116 43	5
Goodwater	33 04	86 03	1	Calexico	32 40	115 28	7
Guntersville	34 22	86 18	1	Camp Baldy	34 15	117 40	1
Hamilton	34 07	87 58	1	Claremont	34 07	117 44	5
Irondale	33 33	86 42	1	Coachella	33 40	116 10	1
Lincoln	33 36	86 03	2	Corona	33 52	117 35	1
Madison	34 41	86 43	1	Covelo	39 47	123 16	1
Maple Grove	34 09	85 49	1	Edison	35 21	118 53	1
Mentone	34 32	85 33	1	El Cajon	32 48	116 58	1
Montgomery	32 23	86 18	1	El Centro	32 50	115 32	1
Moulton	34 30	87 18	1	Eureka	40 48	124 11	3
Oneonta	33 55	86 29	1	Fairmont	34 45	118 25	2
Opelika	32 38	85 21	1	Fresno	36 43	119 49	1
Ozark	31 28	85 37	1	Gray	33 49	116 37	1
St. Bernard	34 11	86 18	1	Gray Mountain	34 38	116 15	2
Scottsboro	34 40	86 02	1	Hollister	36 50	121 20	4
Selma	32 05	87 01	1	Imperial	32 50	115 35	1
Talladega	33 26	86 05	1	Indio	33 43	116 12	1
Valley Head	34 32	85 32	2	Julian	33 05	116 37	2
Vernon	33 46	88 06	1	King City	36 14	121 06	2
Wedowee	33 18	85 29	1				